



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/788,892	02/27/2004	Don C. Powell	303.863US1	4563
21186	7590	03/15/2005	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			LUK, OLIVIA T	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 03/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/788,892

Applicant(s)

POWELL, DON C.

Examiner

Olivia T. Luk

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) 40-49 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-22-33 and 36-39 is/are rejected.
- 7) ☐ Claim(s) 34 and 35 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/16/04.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-39, drawn to process, classified in class 438, subclass 758.

II. Claims 40-49, drawn to device, classified in class 156, subclass 345.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the semiconductor device need not be formed by the process claimed in I using a silicon bearing component selected from a silane or using heat to decompose an oxidizing component.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Sherry Selm on 2/28/05 a provisional election was made without traverse to prosecute the invention of I, claims 1-39. Affirmation of this election must be made by applicant in replying to this Office action. Claims 40-49 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Information Disclosure Statement

6. The information disclosure statement (IDS) submitted on 8/16/04 is being considered by the examiner.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-12, 17-22, 24, 26-31, 36, 38 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Hochberg (4,981,724).

In re claim 1, Hochberg et al. discloses heating a chamber (col. 11, lines 23-30), within which a substrate is located (col. 11, lines 3-10), to a temperature sufficient to thermally decompose an oxidizing component (col. 11, lines 23-30), and passing a gas flow over the substrate to deposit the dielectric film (col. 11, lines 30-45), wherein the gas flow includes a silicon bearing component (col. 12, lines 5-20), the oxidizing component (col. 11, line 43), and a

Art Unit: 2812

chloride component (col. 12, line 22), and wherein the silicon bearing component and the chloride component are distinct from each other (col. 2, line 45-55).

In re claim 2, Hochberg et al. discloses the dielectric film is an oxide film (col. 11, line 33).

In re claim 3, Hochberg et al. discloses the gas flow further includes ammonia, and the dielectric film is an oxynitride film (col. 13, lines 17-20).

In re claim 4, Hochberg et al. discloses the silicon bearing component consists essentially of one or more halated silanes (col. 12, line 19).

In re claim 5, Hochberg et al. discloses the silicon bearing component includes at least one component selected from the group consisting of silane, disilane, monochlorosilane, dichlorosilane, trichlorosilane, and tetrachlorosilane, in any combination (col. 12, line 19).

In re claim 6, Hochberg et al. discloses the chloride component includes at least one component selected from the group consisting of hydrogen chloride and chlorine, in any combination (col. 2, lines 45-55).

In re claim 7, Hochberg et al. discloses the substrate is heated to a temperature in a range between 700 degrees C. and 950 degrees C., inclusive (col. 12, lines 10-15).

In re claim 8, Hochberg et al. discloses the gas flow has a total pressure in a range between 50 milliTorr and 4000 milliTorr inclusive (col. 13, lines 63-64).

In re claim 9, Hochberg et al. discloses heating a substrate to a temperature sufficient to thermally decompose an oxidizing component (col. 17, lines 18-19), and passing a gas flow over the substrate, wherein the gas flow includes a silicon bearing component (col. 17, lines 24-25), the oxidizing component (col. 17, line 23), and chlorine 12, lines 15-20).

Art Unit: 2812

In re claim 10, Hochberg et al. discloses the silicon bearing component consists essentially of dichlorosilane (col. 12, line 19).

In re claim 11, Hochberg et al. discloses the oxidizing component consists essentially of nitrous oxide (col. 11, line 44).

In re claim 12, Hochberg et al. discloses the gas flow further includes ammonia, and the dielectric film is an oxynitride film (col. 13, line 18-20).

In re claims 17 and 30, Hochberg et al. discloses heating a substrate to a temperature sufficient to thermally decompose an oxidizing component (col. 11, lines 3-10), and passing a gas flow over the substrate, wherein the gas flow includes a silicon bearing component (col. 11, line 4), an oxidizing component (col. 11, lines 3-10), an ammonia component (col. 13, lines 17-18), and a chloride component that is distinct from the silicon bearing component (col. 2, lines 45-55).

In re claim 18, Hochberg et al. discloses the silicon bearing component consists essentially of dichlorosilane (col. 12, line 19).

In re claim 19, Hochberg et al. discloses the oxidizing component consists essentially of nitrous oxide (col. 11, line 44).

In re claims 21, 29, and 38, Hochberg et al. discloses the chloride component consists essentially of chlorine (col. 2, lines 45-55).

In re claim 22, Hochberg et al. discloses heating a substrate to a temperature sufficient to thermally decompose an oxidizing component (col. 17, lines 18-19); and passing a gas flow over the substrate, wherein the gas flow includes a precursor component (col. 17, lines 24-25), an

Art Unit: 2812

oxidizing component (col. 17, line 23), an ammonia component (col. 13, lines 17-18), and a chloride component that is distinct from the precursor component (col. 2, lines 44-45).

In re claim 24, Hochberg et al. discloses the precursor component includes at least one component selected from the group consisting of silane, disilane, monochlorosilane, dichlorosilane, trichlorosilane, and tetrachlorosilane, in any combination (col. 12, line 19).

In re claims 26 and 39, Hochberg et al. discloses the precursor component consists essentially of an aluminum bearing component (col. 2, lines 46-49).

In re claim 27, Hochberg et al. discloses the oxidizing component consists essentially of nitrous oxide (col. 11, line 44).

In re claim 31, Hochberg et al. discloses the gas flow further includes an ammonia component, and the dielectric layer is an oxynitride layer having thermal properties that make the semiconductor device suitable for use as an optical waveguide (col. 13, lines 17-18).

In re claim 36, Hochberg et al. discloses heating a silicon substrate, in a furnace deposition tube (col. 8, lines 8-16), to a temperature in a range of 700 degrees C. to 950 degrees C., inclusive (col. 11, lines 1-2), and thermally oxidizing the silicon substrate, in the furnace tube, using gaseous reactants, which include a chloride component, dichlorosilane, and nitrous oxide (col. 2, lines 44-45; col. 11, line 44; col. 12, line 19).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

Art Unit: 2812

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 13-16, 20, 28, 32, 33 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hochberg et al. (4,981,724) in view of Ishitani et al. (5,330,936).

In re claims 13, 20, 28, and 37, Hochberg et al. discloses the claimed elements as above, but fails to teach the chlorine component is hydrogen chloride. Ishitani et al. teaches doping the source gas of ammonia or silane or dichlorosilane with hydrogen chloride gas (col. 2, lines 50-57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have flowed hydrogen chloride for chemical vapor deposition of a silicon oxide film for the benefit of depositing a silicon nitride film only on the silicon film region of the substrate (col. 2, lines 56-57).

In re claim 14, Hochberg et al. further discloses the silicon bearing component consists essentially of dichlorosilane (col. 12, line 19).

In re claim 15, Hochberg et al. further discloses the oxidizing component consists essentially of nitrous oxide (col. 11, line 44).

In re claim 16, Hochberg et al. further discloses the gas flow further includes ammonia, and the dielectric film is an oxynitride film (col. 13, lines 17-18).

In re claim 32, Hochberg et al. discloses the claimed elements, but fails to teach etching a trench into the substrate, wherein the dielectric layer is an oxide deposited on an inner surface of the trench. Ishitani et al. discloses the dielectric layer is an oxide deposited on an inner surface of a trench etched into a substrate (col. 2, lines 24-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the dielectric

Art Unit: 2812

layer as an oxide on an inner surface of a trench for the trench to serve as a bottom electrode (col. 2, lines 25-26).

In re claim 33, Hochberg et al. discloses the claimed elements for forming an oxynitride layer (col. 13, lines 17-18), but fails to teach allowing a native oxide layer to form prior to depositing the dielectric layer; depositing a nitride layer over the native oxide layer prior to depositing the dielectric layer, and wherein depositing the dielectric layer includes also including an ammonia component in the gas flow, so that the dielectric layer is an oxynitride layer. Ishitani et al. teaches allowing a native oxide layer to form prior to depositing the dielectric layer (col. 2, lines 51-55); depositing a nitride layer over the native oxide layer prior to depositing the dielectric layer (col. 2, lines 62-65), and wherein depositing the dielectric layer includes also including an ammonia component in the gas flow (col. 2, line 54). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed a native oxide layer to form prior to depositing the dielectric layer; depositing a nitride layer over the native oxide layer prior to depositing the dielectric layer, and wherein depositing the dielectric layer includes also including an ammonia component in the gas flow for forming a stacked capacitor.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2812

6. Claims 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hochberg et al. (4,981,724) in view of Chung et al. (6,838,125).

In re claims 23 and 25, Hochberg et al. is applied supra, but fails to teach the precursor component consists essentially of a tantalum bearing component. Chung et al. teach a method of film deposition using a precursor component consisting essentially of a tantalum bearing component (col. 8, lines 1-7). It would have been obvious to one having ordinary skill in the art to have used a tantalum bearing component as the precursor in Hochberg et al. for the purpose of forming a metal film with tantalum (col. 7, lines 66-67).

Allowable Subject Matter

7. Claims 34 and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In re claim 34-35, prior art of record fails to teach the device includes one or more gates and the dielectric layer forms one or more spacers for isolating the gates.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References not applied are considered state of the art in the area of semiconductor manufacture.

Art Unit: 2812

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Olivia T. Luk whose telephone number is 571-272-1676. The examiner can normally be reached on 8AM to 5PM Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

OTL
March 9, 2005


MICHAEL LEBENTRITT
SUPERVISORY PATENT EXAMINER